

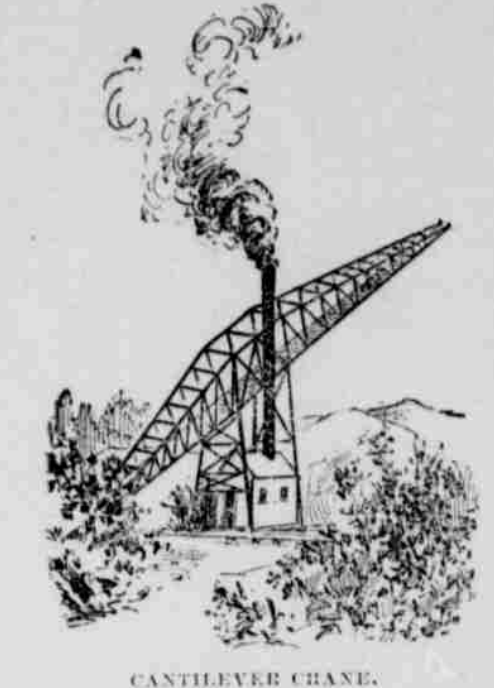
## CHICAGO'S BIG DITCH.

### DESCRIPTION OF THE GREAT DRAINAGE CANAL.

How It Impressed a Correspondent for a New York Journal—Described as the Most Extensive Piece of Engineering Work Under Way in World.

#### The Millions Already Spent.

The biggest ditch in the world is being dug in Illinois, and from 5,000 to 8,000 men have been employed upon the work almost constantly for over two years. This is the largest number of laborers employed upon any single work of improvement



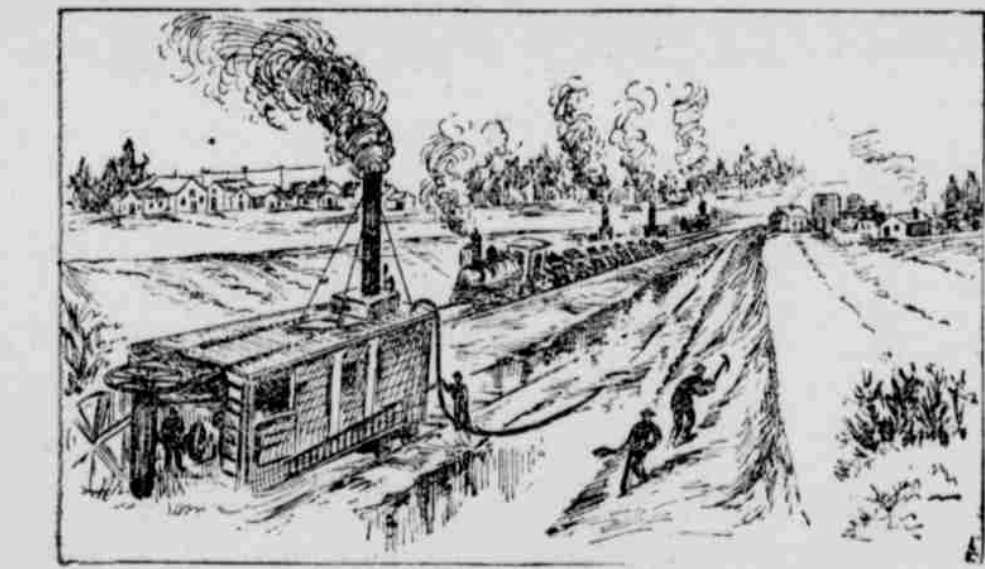
CANTILEVER CRANE.

In the United States, certainly, and perhaps in the whole world, for no other great canal, but one great railway, and no extensive system of dykes, docks or dams are now in course of construction anywhere. These statements may cause some surprise, but they are true nevertheless. A similar state of affairs has not obtained in this country for a score and a half of years.

The big ditch now under way in Illinois is the forerunner of various similar works to be undertaken in response to a new demand for a method of moving heavy freight at lower rates than the railroads can afford, even if at less speed, although the primary use of this great trench, which is known as the Chicago Drainage Canal, will be to furnish an outlet for the sewage of Chicago, so that it need no longer pollute Lake Michigan, whence the city gets its water supply. But the canal is being built with special reference, also, to its forming one link in the chain of channels, artificial and natural, that shall connect the great lakes with the Gulf of Mexico, and be deep and wide enough to enable large vessels to reach Chicago and thence all ports upon the shores of the fresh water seas.

This chain of deep water channels will be composed of the Chicago Drainage Canal, the Desplaines and Illinois rivers and the Mississippi from Grenfell, Ill., south to the Gulf. The completion of the work will open to ocean-going boats the most extensive system of inland navigation in the world, 1,700 miles of lake, 1,600 miles of large river navigation and 320 miles of canal and improved rivers, 3,620 altogether, or one-fifth more miles than from New York to Southampton.

The Chicago Drainage Canal proper will be thirty miles long, reaching from Ashland Avenue, Chicago, to Lockport, Ill., and crossing the divide that separates the basin of the great lakes from the valley of the Mississippi. Ten miles of it are cut through solid rock, often bed rock, underlying tough boulder clay, and the remainder through river mud and glacial drift, to a maximum depth of 38 feet. The rock cut is 160 feet wide, with vertical sides. The portion traversing hard boulder clay is 210 feet wide on the bottom, with sides sloping out in prism shape.



STEAM SHOVELS ON SECTION D.

These wide portions make up twenty of the twenty-eight miles. The remaining eight miles, which traverse soft earth and can easily be dredged out to full ship-canal width later, are but 110 feet wide on the bottom, with sloping sides. The minimum depth of the whole stream will be 22 feet.

#### Work Proceeding Rapidly.

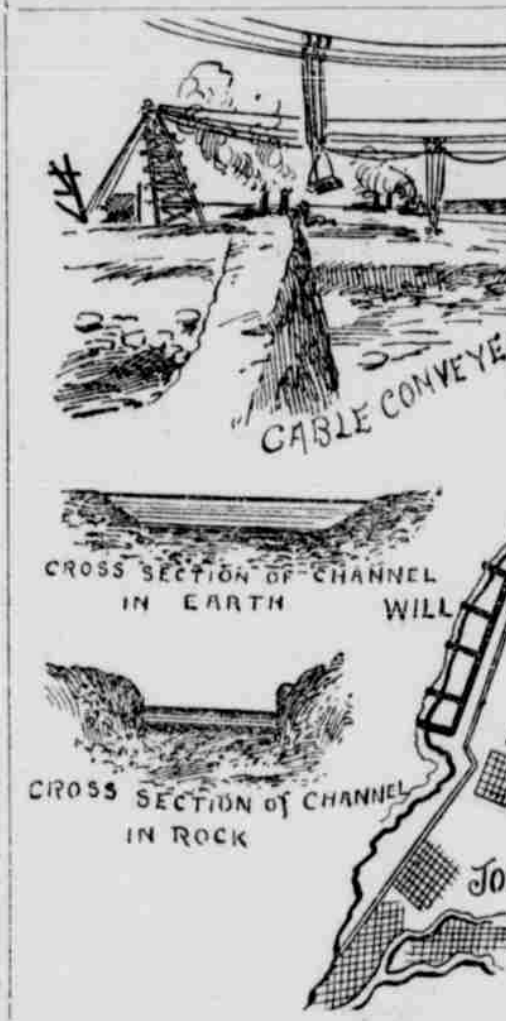
In two more years this great artificial river will be draining Chicago into the Mississippi and robbing Niagara of 300,000 cubic feet of water per minute, for the benefit of the Gulf of Mexico—and of those inhabitants of Chicago who drink water. Yet it is but two years since the first spadeful of earth was thrown. The difficulties that have been overcome in the work are far greater than would naturally be expected in a country without so much as a hill or hummock to break its level monotony. One of these difficulties was a stretch of ten miles of solid limestone bed rock. But by the use of steam channeling machines this has been cut through, so as to leave wall as smooth and straight and white as so much saved ice.

The greatest obstacle of all was the Desplaines River, which chimbered more than a dozen miles of the path and threatened with its periodic floods to sweep the earth dikes of the new channel away at every spring freshet. But the engineers looked over the ground and calmly said: "We will transplant the Desplaines river." And they have done it, building an entire new river channel for more than thirteen miles, at a cost of over \$1,000,000. "But what will you do with the flood waters while you are building your river-diversion channel?" asked the skeptic. "We will spill them into Lake Michigan

and send them down the St. Lawrence instead of down the Mississippi," said the engineers. And they have done it. At the head of the river diversion they have built an enormous safety valve, in the form of a "spillway," or dam, 397 feet long and 164 feet high, made of concrete, capped with stone, and flanked with wings of stone masonry. So, when the Desplaines goes on a rampage, and the water gauge above this spillway indicates over 300,000 cubic feet of flow per minute, the surplus flood waters are dumped across this dam and sent down the Chicago river to Lake Michigan. The river diversion is all finished. This is 200 feet wide on the bottom, with sides sloping out, giving the cross section the form of a prism. The pitch or grade of the channel is about one foot in a mile and a half. Thus the river is successfully out of the way.

The main drainage channel is now under contract throughout its entire length, from its confluence with the Chicago river at Robey street to Lockport, Will County, Ill., twenty-eight miles to the southwest of Chicago. The work has been subdivided into sections averaging a mile in length. Beginning at the Willow Springs road, a midway point, the sections are lettered toward Chicago from A to O, section O being that which connects with the Chicago river. From the Willow Springs road southwestward the sections are numbered from 1 to 15. These include the rock cut, and were the first to be put under contract. Sections numbered from 1 to 14 were let in July, 1892; section 15 was put under contract last August.

The lettered sections running up to Chicago are, with some exceptions, cut through "glacial drift." Glacial drift comprises the top soil, earth, muck, sand, gravel, clay, hardpan, boulders—all the loose debris deposited upon the bed rock by the prehistoric glaciers that gouged their trail along the Desplaines Valley. The work on sections A, B and a portion of C traverses the old bed of the Desplaines river and has to deal with ooze, which covers the clay to a considerable depth. This is managed very efficiently—



Showing the portion under contract, with a skeleton of the route to St. Louis and views of the work reproduced from photographs.

by the use of hydraulic dredges that send a continuous stream of water and black muck flowing through a twenty-inch pipe to any required distance within 3,000 feet. Each of these dredges has a capacity of 2,500 cubic yards in ten hours. By an ingenious use of revolving knives, one contractor is also pulverizing the harder material beneath the ooze, and is pumping it out along with the water. This river ooze, by the way, is proving a bo-

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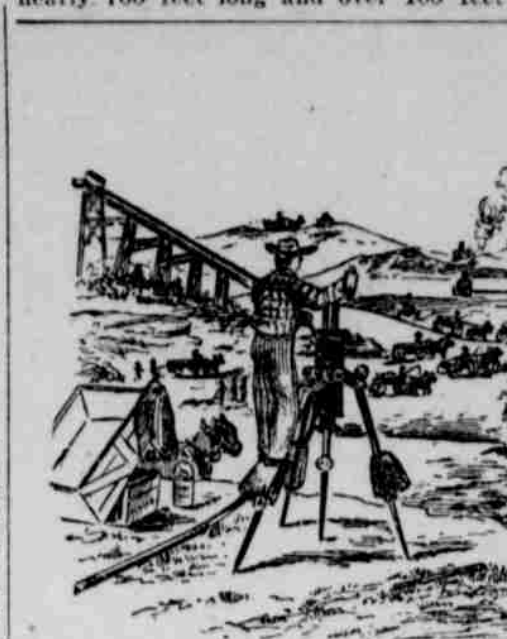


ONE OF THE CAMPS.

lowered from the end of the cantilever overhanging the channel. The cantilever, which looks like an enormous iron bridge with narrowed ends tipped up at an angle, stands on the bank upon a track running parallel with the canal. It can be moved along bodily by steam power as easily as the bucket is carried up the incline to be dumped automatically at the further ex-

trinity. The apparatus works rapidly and so successfully that there now eleven of these cantilevers in constant operation on four sections.

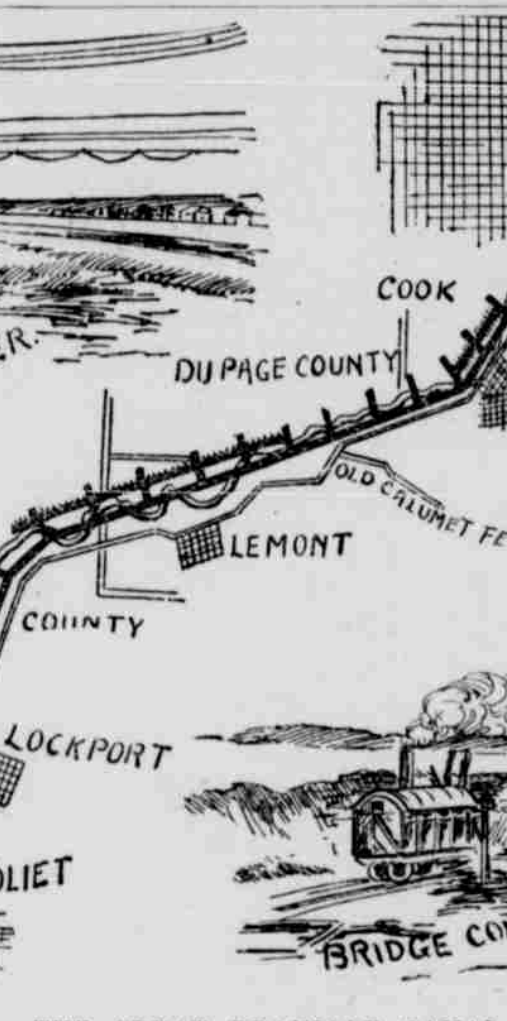
A still more imposing device spans the canal near Willow Springs. It is probably the most unique piece of machinery on the continent, and can be seen for many miles. It is a piece of iron bridge work in the shape of an enormous chair rocker, nearly 700 feet long and over 100 feet



AT WORK ON SECTION 14, NEAR LEMONT.

high. It spans the channel, with its horns running up over each spoil bank, and is moved on a track as the work progresses. Under it runs an elaborate and expensive belt to convey the excavated material to the ends of the horns and dump it over the spoil area. Nothing like this machine was ever seen before on land or sea. As it has failed, however, to work as economically as the simple cantilever, it is probable that it will not be duplicated.

One of the favorite pieces of apparatus is the cableway. This consists of two towers, over 100 feet high, one on each bank of the canal, connected with a run-



THE GREAT DRAINAGE CANAL.

ning cable at the top, by means of which the buckets of spoil are rapidly conveyed to the dumping place. The cableways first constructed were not very successful, but experience has led to several radical improvements, until now, by the adoption of a simple device, hit upon by H. C. Locher, one of the contractors, they have been brought to a state of efficiency which makes them worthy competitors with the cantilevers.

#### Curious Machinery.

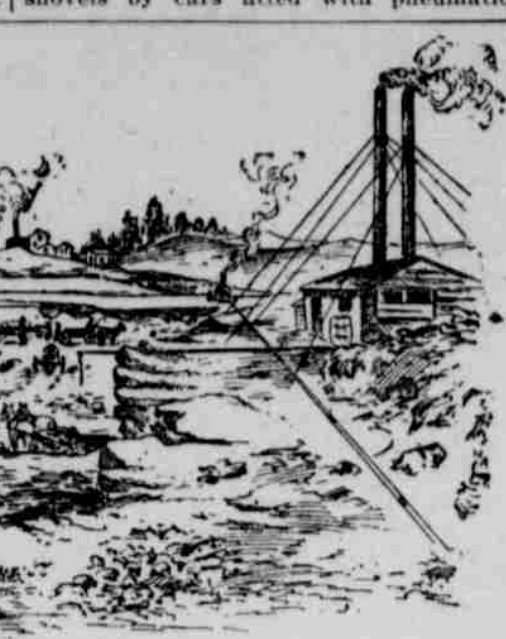
Another curious and successful contrivance that stands on the edge of the channel and dominates the prairie in the region of Lockport, is a turning tower with a derrick and hoist on each side. It looks more like a big, old-fashioned windmill than anything else. The buckets or cages of one derrick are loaded by the workmen with blasted rock debris at the bottom of the channel. Then these are hoisted high in the air, and the whole tower is set revolving, like a swing bridge, bringing the loaded cages over the spoil bank, to be dumped and throwing the opposite derrick over the channel to receive its load. This machine works rapidly and economically.

On these sections which are partly in earth and partly in rock all the usual methods of excavation are in vogue, and several that are entirely new. On the rock sections the sides are cut down vertically by channeling machines, leaving the sides of the canal, after the channel has been blasted out, as smooth as if made of the most neatly finished concrete. Of course, steam drills are used in blasting, and on the sections which are doing the most profitable work these are worked from a central power station by compressed air. The channeling machines cut the sides down vertically to a depth of ten feet at each cut. This layer or "slope," is blasted out, and then the machine cuts to a further depth of ten feet, leaving only six inches of offset to show where the new slope begins. The rock is thus excavated in three slopes or layers. The top layer is removed by carts and tram cars, the traction for which is usually supplied by steam hoisting engines. The lower lifts are taken out by the use of cableways, high power derricks, and cantilever conveyors.

The cross section of the earth excavations shows a width of 202 feet on the bottom, with the sides sloping out, so as to make an extreme width of 300 feet at the top of the prism. This wide portion of the canal—twenty miles in all—extends for some distance, and then reduces to 110 feet on the bottom, preserving the same side slopes. In the rock sections the sides are vertical, and the width of the channel is uniformly 100 feet.

The methods of working on the earth sections present some novelties. Cars, specially constructed, are loaded by steam shovels and drawn by steam hoists up a steep incline to a proper height, where they are run upon a trolley and automatically dumped. The contractors have erected great iron bridges, spanning the spoil bank high in the air, their supporting piers being carried on trucks, which travel on tracks parallel with the channel. From the channel end of the bridge an in-

clined track runs down into the cut, and on this two cars, with a capacity of eight cubic yards each, are kept running up and down, being successively loaded by steam shovels, drawn swiftly up the incline by a steam hoist and automatically dumped over the spoil area. By this combination of devices an output of 100 cubic yards of earth per hour can be maintained all day. The material is taken from the steam shovels by cars fitted with pneumatic



BRIDGE CONVEYER.

dumping apparatus, the power for which is supplied from the locomotive. The engineer operates these dumps just as he would apply the air brakes.

Up to the beginning of last November there had been expended by the district \$2,370,030 for right of way and \$6,079,200 for construction, making a total of \$8,449,230. This amount, together with the cost of administration, payment of bonds, interest, etc., brings the total expenditures of the enterprise to date up to over \$10,000,000. The total estimated cost of the work under contract is: For construction, \$18,747,846; for right of way, \$2,606,228; total, \$21,354,074. Add



CABLE CONVEYER.

to this the cost of administration until the completion of the canal, and the sum will represent the total cost to the taxpayers of the district benefited. This total President Wenter confidently asserts, will not reach \$28,000,000. Others think there may be unexpected difficulties that will raise the cost to nearly \$30,000,000.

#### Caring for the Men.

One of the problems with which the contractors have to deal is that of caring for the men employed on the work. On each section there are from 200 to 400 men employed, and the majority of them are so distant from any town that provision must be made for the men at the work. For this purpose each section is provided with a camp consisting of rough frame buildings, some of them equipped with bunks for sleeping quarters and others with outfits for providing meals. Some idea of the extent of this work can be obtained from the fact that on one section a bakery is established which turns out from 400 to 500 loaves of bread each day. Some of the contractors carry on this department under their own supervision, but others find it much more profitable to make a contract with a commissary, who furnishes bedding and provisions at a stipulated price.

It is stated that the prices being paid for this work are far lower than those paid for any similar work ever carried on in the world, and that this is particularly true of the rock sections. The prices paid for the removal of the rock mostly range from 73 cents to 83 cents per cubic yard, and it is said that the lowest previous prices on record for similar work have ranged from \$1.25 to \$1.50. Prices paid for glacial drift generally run from 10 cents to 25 cents per cubic yard.



CHANNELING MACHINE.

The pictures accompanying this article show very clearly the nature of the work now going on in Illinois, and some of the novel and expensive machinery that is being employed. By its use at least one-third more work is accomplished in proportion to the amount of money expended and the number of men employed than could have been twenty years ago.

## THE SUNDAY SCHOOL.

### THOUGHTS WORTHY OF CALM REFLECTION.

A Pleasant, Interesting, and Instructive Lesson, and Where It May Be Found—A Learned and Concise Review of the Same.

#### Lesson for March 17.

Golden Text.—"The Son of man is come to seek and to save that which was lost."—Luke 19: 10.

"Zaccheus the Publican" is the subject of this lesson, which is found in Luke 19: 1-10. This lesson follows well upon the one of last week. Both are concerning men who were rich. Last week it was the rich young ruler; this week the rich publican. Yet how strong the contrast! With the young man riches were allowed to be a bar to his entrance for the kingdom of heaven. In the case of Zaccheus, far from staying the feet of the well-to-do tax gatherer, his riches were made but the larger pledge of his devotion. There are rich men to-day, and men who are to become rich. How will they use their wealth? Shall they make friends out of the mammon of unrighteousness? friends and fortune unto eternal life; or eternal enmity and misery? Shall wealth be employed for the flesh or for Christ; in the interest of this world or of two worlds? This is the personal and pertinent question for us all, for we all have some sort of wealth.

"And Jesus entered and passed through Jericho." Take the moments as they fly. A gracious opportunity, seize it. The incident at the city's edge, just prior, is suggestive. A blind man sitting there and begging, heard the tramp of feet. Then arose that strident cry: "Jesus, thou son of David, have mercy on me." In another way Zaccheus seems to have expressed the same eager, personal interest. His climbing of the sycamore was itself an appeal. Bartimeus made up for his blindness by his clamorous voice. Zaccheus helped out his deficient stature by means of the tree boughs. If you would see Jesus, show it.

"And he was rich." The blind man was poor, a beggar. The publican was rich, very rich, perhaps. Thank God for this instance. Christ is not for the poor alone, and no more for the rich. But also no less. He was "chief among the publicans," a tax gatherer. This means that he was not only wealthy, but in a way to grow wealthier. Ah, here is the test. So many men fear to take Jesus lest he interfere with their business, and, as with these men at Jericho, the hope of their gains be gone. And did Zaccheus simply wish to see who it was that was going by in the throng; a mere passing curiosity? Nay, he wished "to see Jesus, who he was." He had heard of him and his gracious mission before.

#### Hints and Illustrations.

The right use of riches. There are other lessons, but this is the paramount one. And never was there greater need for instruction on this point. Never was there greater wealth in the church, and never perhaps such hindrance to our denominational benevolences through means withheld. We have need of a financialist to go through the churches and bring us to the mourners' bench because of our avarice. Nay, we have need of the Spirit of God to convict us of the sin of selfishness. Put the truth strongly; we can scarcely be too severe.

Zaccheus' prompt adjustment of his means was not simply a partition with his Master. It proved rather a spirit of total consecration. He had taken a new master, when it was said that Christ "was gone to be a guest with a man who was a sinner." Possibly it was wealth that was master before. But, unlike the rich young ruler who quickly proved by his actions that he was himself ruled by his riches, Zaccheus indicates that he is above and over his wealth, and he can use it to the glory of God. Thank God for such an example. With man impossible, with God possible. And how possible? By the implanting of a new motive and ideal. For where your treasure is, there will your heart be also.

A lesson or two. I know now what "the higher life" means. It is to have affections set on high, and rich or poor, our steps following the lofty ideal of God. Contrariwise, I know, too, what it is to live a low life. High life in the great city is not high life in heaven. God has his own picked "four hundred." They are those who refuse to live for the perishing things of earth. The arbiter of that earthly guild of select people in New York city, went to the dust the other day and made his bed with the four hundred million who wait the judgment in their graves. No quality there. I know now the secret of Christ's marvelous life upon earth. His hard denials were not in answer to the "Son of man, behold these stones," or "all these things I will give thee," but to withhold himself a little longer amidst the fleeting joys of earth from the joy set before him and the glory that he had with the Father before the world was. Hence he could endure the cross and despise the shame. Perhaps here is your mistake and mine. How can we endure and despise earthly things without the higher joy set before? And I know now what wealth is for, it is to tell where the heart is and where other hearts ought to be and to call very loudly along that way. The larger the wealth the stronger the testimony for or against God. And I know, too, what my heart is for. It is for finding and appreciating the highest treasure. We are restless for God. This pain of hell is a misplaced affection that finds no satisfaction. The joy of heaven is eternal satisfaction with the riches of Christ. On this kind of a life do we see Zaccheus entering even here. And there are others like him.

How to be rich and serve God. It is the lesson Zaccheus is teaching. And we have some new witnesses in this generation, men who make money for Christ's sake and pour it out lavishly in his name. Next Lesson—"The Mission of the Servant."—Luke 10: 1-9.

Patience is a virtue for which there is no substitute. There is often no other way out of a difficulty than the way of patience. But really this is a most gracious way, when the sufferer finds it. Nor is it a way which any one need be ashamed to take, for our Lord recommends it: "In your patience ye shall win your souls." If he knows that there is often nothing left to us but this one thing—patience. We must use it; we must win our souls, our very lives, by it.

## WAS GOULD INSANE?

### Financial Worry and Physical Exertion Not the Greatest Destroyer of Human Life.

For Humanity's Sake, After Thirty-six Years of Nerve-Creeping Slavery, He Tells How He Was Set Free.

Caldwell, N. J., March 11, 1895.—(Special.)—Since one of our prominent citizens suffered so terribly from tobacco tremors, has made known his frightful experience in behalf of humanity, the ladies here of New York City, who are husbands' lives miserable with their entreaties to at once quit tobacco.

The written statement of S. J. Gould is attracting wide-spread attention. When interviewed tonight he said: "I commenced using tobacco at thirteen; I am now forty-nine; so, for thirty-six years I chewed, smoked, snuffed and rubbed snuff. In the morning I chewed before I put my pants on, and for a long time I used two ounces of chewing and eight ounces of smoking a day. Sometimes I had a chew in both cheeks and a pipe in my mouth at once. Ten years ago I quit drinking water, I tried to stop tobacco time and again, but could not. My nerves craved nicotine and I fed them till my skin turned a tobacco-brown, cold, sticky perspiration oozed from my skin, and trickled down my face the least exertion or excitement. My nerve vigor and my life was being slowly sapped. I made up my mind that I had to quit tobacco or die. On October 1 I stopped, and for three days I suffered the tortures of the damned. On the third day I got so bad that my partner accused me of being drunk. I said, 'No, I have quit tobacco.' 'For God's sake, man,' he said, offering me his tobacco box, 'try a pipe; you will go wild,' and I was wild. Tobacco was forced into me and I was taken home dazed. I saw double and my memory was beyond control, but I still knew how to chew and smoke, while I did all day until towards night, when my system got tobacco-soaked again. The next morning I looked and felt as though I had been through a long spell of sickness. I gave up in despair, as I thought I could not cure myself. Now, for suffering humanity, I'll tell what saved my life. Providence evidently answered my good wife's prayers and brought to her attention in our paper an article which reads: 'Don't Smoke Spit and Smoke Your Life Away.'"

"What a sermon and warning in these words! Just what I was doing. I told about a guaranteed cure for the tobacco habit, called No-To-Bac. I sent to Druggist Hasler for a box. Without a grain of faith I spit out my tobacco end, and put into my mouth a little tablet upon which was stamped No-To-Bac. It was too good to be true. It seemed like a dream. I took eight tablets the first day, seven the next, five the third day, and all the nerve-creeping feeling, restlessness and mental depression came gone. It was too good to be true. It seemed like a dream. That was a month ago. I used one box. It cost me \$1, and it is worth a thousand. I gained ten pounds in weight and lost all desire for tobacco from the first day of sleep and eat well, and I have been benefited in more ways than I can tell. No, the cure was no exception in my case. I know of ten people right here in Caldwell who have bought No-To-Bac from Hasler, and they have been cured. Now that I realize what No-To-Bac has done for me and others, I know why it is that the makers of this wonderful remedy, the Sterling Remedy Company, of New York and Chicago, say: 'We don't claim to cure every case. That's Frank's talk, a lie; but we do guarantee three boxes to cure the tobacco habit, and in case of failure we are perfectly willing to refund money.' I would not give a public endorsement if I were not certain of its reliability. I know it is backed by men worth a million. No-To-Bac has been a God-send to me, and I firmly believe it will cure any case of tobacco-using if faithfully tried, and there are thousands of tobacco slaves who ought to know how easy it is to get free. There's happiness in No-To-Bac for the prematurely old men, who think as I did that they are old and worn out, when tobacco is the thing that destroys their vitality and manhood."

The public should be warned, however, against the purchase of any of the many imitations on the market, as the success of No-To-Bac has brought forth a host of counterfeiters and imitators. The genuine No-To-Bac is sold everywhere, a guarantee to cure, by all druggists, and every tablet has the word No-To-Bac plainly stamped thereon, and you run no risk of purchasing a cheap imitation in purchasing the genuine article.

#### It Is Merely Good Health.

That beautiful complexion is health, preserved by Ripans Tablets. Ripans Tablets purify the blood, clear the skin of blemishes and make life more worth living.

Think of it ladies! You can permanently beautify your complexion with Glenn's Sulphur Soap. "Hill's Hair and Whisker Dye," Black or Brown, 50c.

## A Bank Failure.

### AN INVESTIGATION DEMANDED.

A general banking business is done by the human system, because the blood deposits in its vaults whatever wealth we may gain from day to day. This wealth is laid up against a rainy day "as a reserve fund"—we're in a condition of healthy prosperity if we have laid away sufficient capital to draw upon in the hour of our greatest need. There is danger in getting thin, because it's a sign of being low in health. To gain in blood is nearly always to gain in wholesome flesh. The odds are in favor of the germs of consumption, grip, or pneumonia, if our liver be inactive and our blood impure, or if our flesh be reduced below a healthy standard. What is required is an increase in our germ-fighting strength. Dr. Pierce's Golden Medical Discovery enriches the blood and makes it wholesome, stops the waste of tissue and at the same time builds up the strength. A medicine which will rid the blood of its poisons, cleanse and invigorate the great organs of the body, vitalize the system, thrill the whole being with new energy and make permanent work of it, is surely a remedy of great value. But when we make a positive statement that 98 per cent. of all cases of consumption can, if taken in the early stages of the disease, be cured with the "Discovery," it seems like a bold assertion. All Dr. Pierce asks is that you make a thorough investigation and satisfy yourself of the truth of his assertion. By sending to the World's Dispensary Medical Association, Buffalo, N. Y., you can get a free book with the names, addresses and photographs of a large number of those cured of throat, bronchial and lung diseases, as well as of skin and scrofulous affections by the "Golden Medical Discovery." We also publish a book of 100 pages, being a medical treatise on consumption, bronchitis, asthma, catarrh, which will be mailed on receipt of address and six cents in stamps.